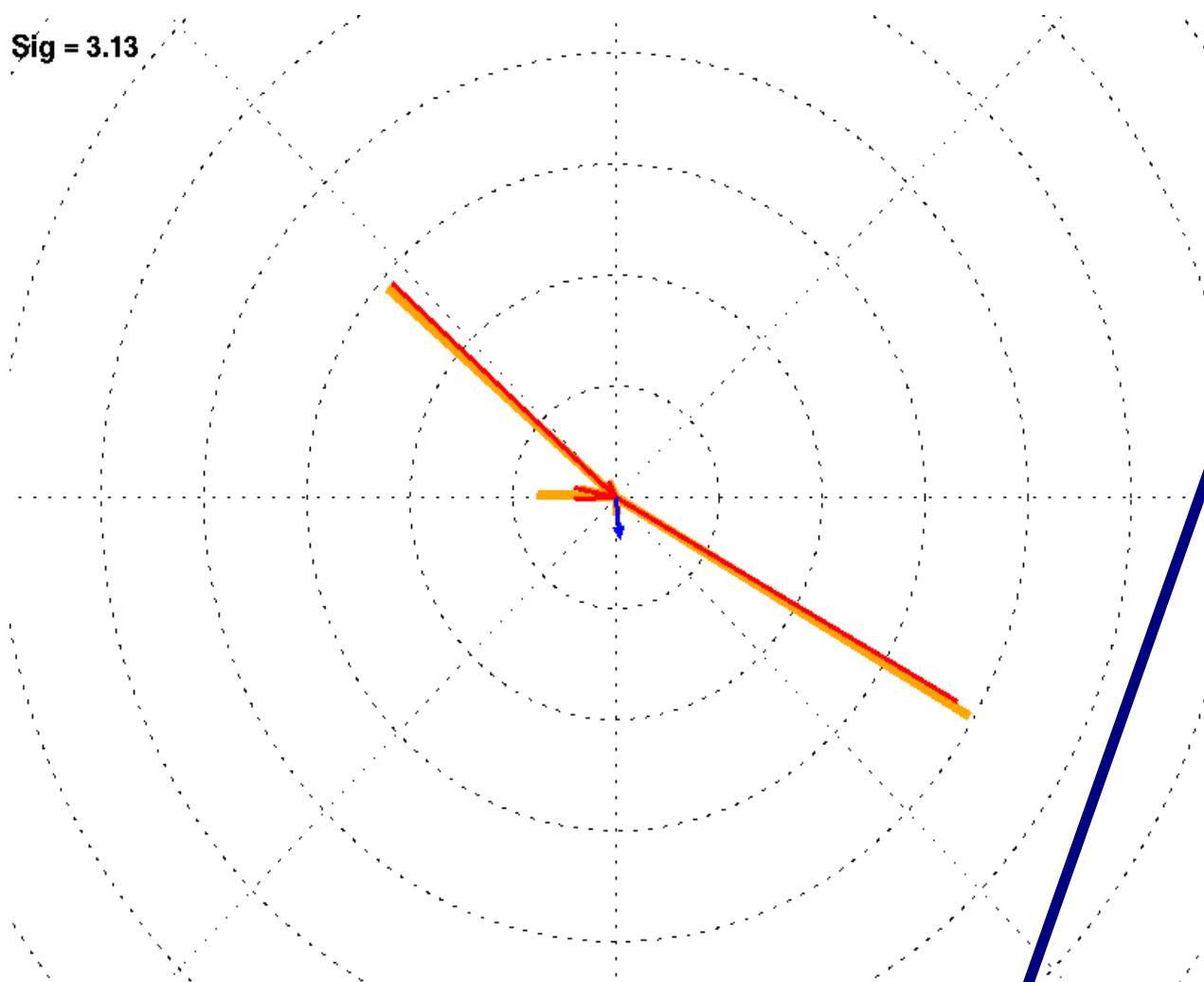


# Looking at High-MET QCD Events

- MET>150 GeV
- genMET<50 GeV
- iterativeCone5CaloJets w/Type1 corrections
  - MCJetCorJetIcone5
  - corMetType1Icone5
  - $|\Delta\phi(j, \text{MET})| > 0.35$  (20 degrees) for lead two jets
  - $|\pi - \Delta\phi(j, \text{MET})| > 0.35$  (20 degrees) for lead two jets
  - $|\Delta\phi(j, \text{MET})| < 2.0$  for lead jet

# Event #1

Sig = 3.13

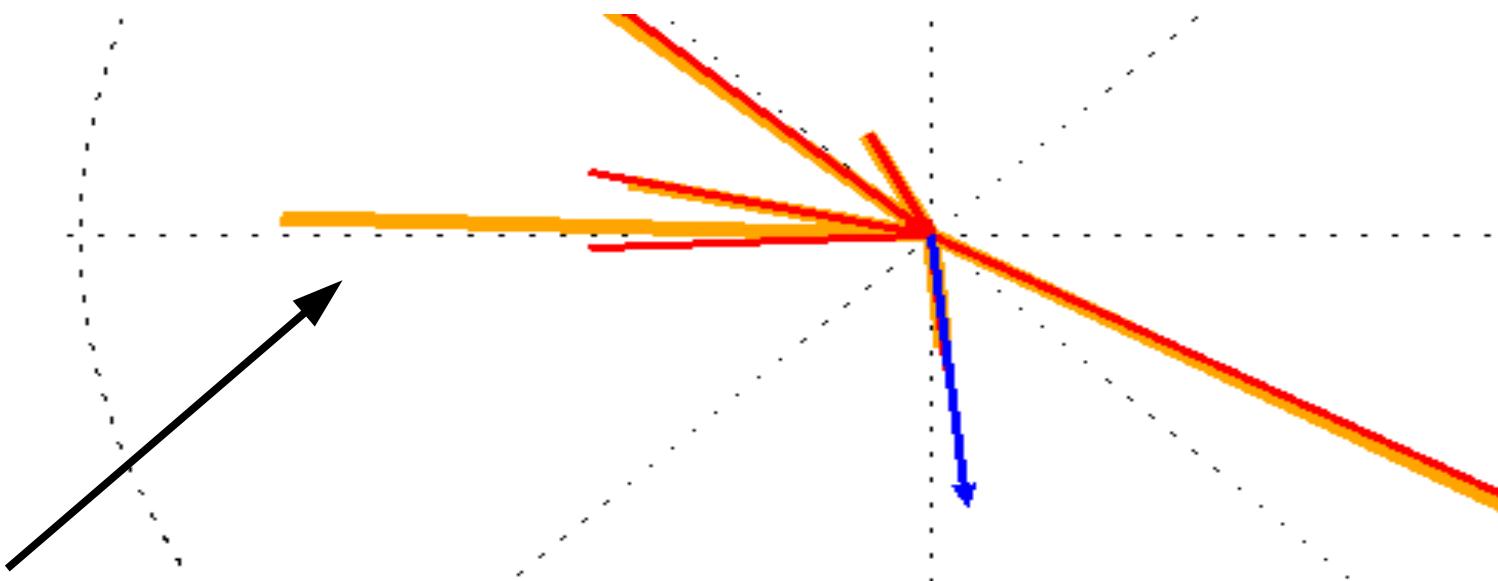


gen jets orange, corrected reco jets red  
corrected MET blue

Gen. Met			
ET = 0.8 GeV phi = 0.22			
Reco Met			
ET = 196.5 GeV phi = -1.46			
Uncorr Met			
ET = 145.0 GeV phi = -2.33			
Gen. Jet	ET	Phi	Eta
1982.7	-0.52	-0.38	
1454.2	2.44	1.13	
382.8	3.11	0.85	
181.9	2.94	-0.31	
81.5	2.06	1.64	
80.9	-1.47	-1.42	
24.0	3.01	-1.52	
Reco Jet	ET	Phi	Eta
1896.3	-0.50	-0.35	
1452.2	2.41	1.17	
205.3	2.92	-0.26	
201.2	-3.10	0.97	
96.1	-1.48	-1.40	
80.8	2.04	1.70	
26.4	2.95	-1.51	
16.6	2.62	0.57	
10.0	1.69	-4.90	

angle between uncorrected, corrected MET  
is large

# Event #1 (closeup)



- 1 badly reco'd jet
  - looks like high-pT pion ( $pT \sim 110$  GeV) either punches through or slips through crack
- Expect MET to be more closely aligned with bad jet (as the uncorrected MET is)

# MET Corrections

$$\text{MET}^{\text{corr}} = \text{MET}^{\text{uncorr}} - \sum (\mathbf{p}_T^{\text{corr}} - \mathbf{p}_T^{\text{uncorr}})$$

- Verified that uncorrected MET is vector sum of caloTowers
- Calculate corrections for all corrected jets > 10 GeV

# MET Corrections from Jets

Uncorr. Jet ET	Uncorr Jet Phi	EMF	Corr Jet ET	Corr Jet Phi	D(Ex)	D(Ey)
1600.49	-0.51	0.62	1896.27	-0.5	260.36	-140.39
1305.07	2.42	0.77	1452.15	2.41	-108.6	99.21
145.06	-3.1	0.45	201.18	-3.1	-56.08	-2.11
137.29	2.92	0.61	205.25	2.92	-66.3	14.94
55.86	-1.48	0.91	96.13	-1.48	3.74	-40.1
48.58	2.04	0.43	80.8	2.04	-14.56	28.74
10.2	2.96	0.32	26.44	2.95	-15.92	3.22
4.67	2.62	0.2	16.61	2.62	-10.35	5.95
TOTAL:					-7.72	-30.53

Uncorrected MET: 144.97 GeV, phi :-2.33

with Jet Corrections:

METx, y:	-99.79	-105.16
<b>METx, y:</b>	<b>-92.07</b>	<b>-74.63</b>

Corrected MET: 196.54 GeV, phi: -1.46

<b>METx, y:</b>	<b>21.73</b>	<b>-195.33</b>
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- Jets in yellow are those I wouldn't expect to be corrected/contribute to  $\Delta$ MET according to MET note (jet pT<10 or jet EMF>0.9)
- How does uncorrected MEx of -100 GeV become corrected Mex of 22 GeV??

# Another high-MET event

$| = 2.67$

Reco-gen jet comparisons look good

Reco-uncorrected MET differ by a fair amount (55 GeV)

Gen. Met			
ET = 0.3 GeV phi = 3.10			
Reco Met			
ET = 165.1 GeV phi = 1.17			
Uncorr Met			
ET = 109.8 GeV phi = 1.32			
Gen. Jet	ET	Phi	Eta
1769.2	1.53	-0.10	
1347.9	-1.48	-0.11	
515.5	-1.68	-0.80	
175.6	-2.81	1.80	
161.2	0.97	-0.86	
48.0	-3.08	-1.44	
44.2	0.92	3.00	
41.0	-2.60	-2.35	
Reco Jet	ET	Phi	Eta
1758.2	1.53	-0.13	
1335.5	-1.49	-0.14	
455.7	-1.71	-0.81	
178.4	-2.82	1.80	
146.7	0.97	-0.89	
59.1	-3.08	-1.37	
51.6	0.92	3.02	
44.0	-2.60	-2.38	
23.6	0.25	-1.26	
17.2	-2.54	3.99	
16.8	-1.70	-1.35	
16.4	0.12	-3.03	
16.2	-1.71	0.99	
13.8	3.08	2.23	
13.6	2.17	1.01	
12.7	-0.24	4.89	
10.5	-2.58	3.24	

# MET Correction Calculations (again)

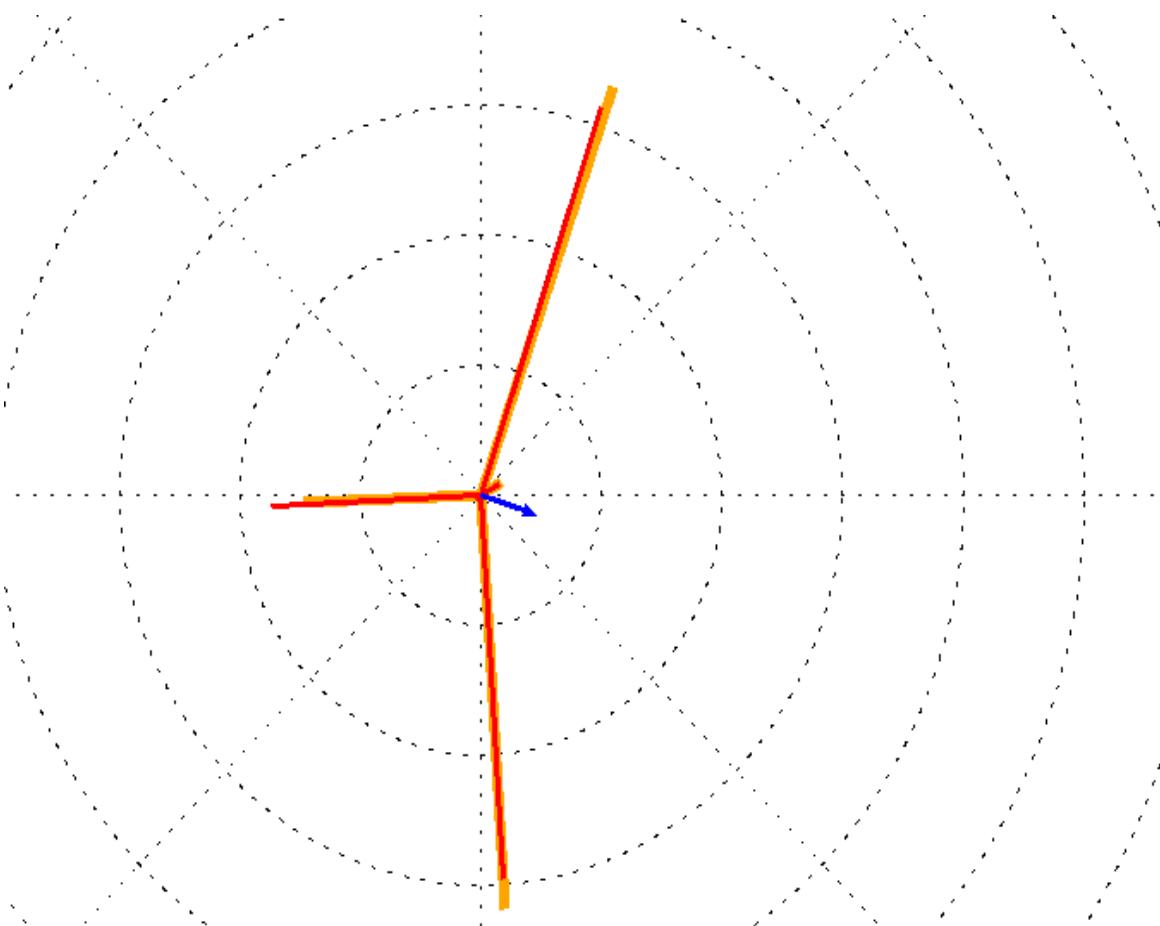
Uncorr. Jet ET	Uncorr Jet Phi	EMF	Corr Jet ET	Corr Jet Phi	D(Ex)	D(Ey)
1284.73	1.53	0.33	1758.22	1.53	17.74	473.16
1117.77	-1.5	0.53	1335.52	-1.49	33.36	-215.88
333.33	-1.69	0.64	455.69	-1.71	-24.25	-120.24
140.91	-2.82	0.34	178.38	-2.82	-35.54	-11.88
104.69	0.97	0.68	146.71	0.97	24.04	34.47
37.98	0.93	-0.08	51.58	0.92	8.23	10.83
29.67	-3.09	0.88	59.14	-3.08	-29.41	-1.95
26.66	-2.6	0.66	43.99	-2.6	-14.85	-8.93
7.77	0.25	0.44	23.62	0.25	15.35	3.96
7.36	-2.56	0.39	17.2	-2.54	-7.99	-5.75
TOTAL:					-20.67	159.57
Uncorrected MET:	109.78	1.32	METx, y:		27.24	106.35
with Jet Corrections:			METx, y:	47.92	-53.23	
Corrected MET:	165.13	1.17	METx, y:	63.74	152.33	

After applying jet corrections, MET < 150 GeV. Why don't I see this in corrected MET?

# The Big Question

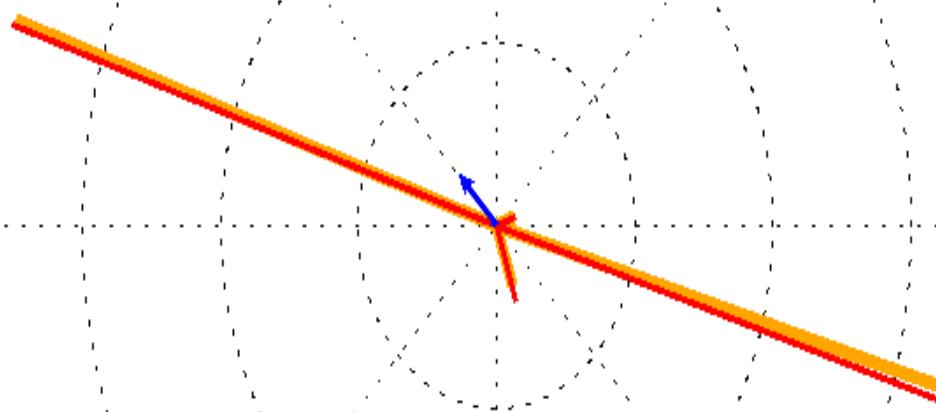
- What am I doing wrong in calculating corrected MET?
  - Starting with uncorrected MET from caloTowers
  - Correcting for all corrected jets $>10\text{ GeV}$
  - Why are results so different?
- Is this an issue in correction code?
  - May cause events to mistakenly pass my high-MET cuts

# More bad events:



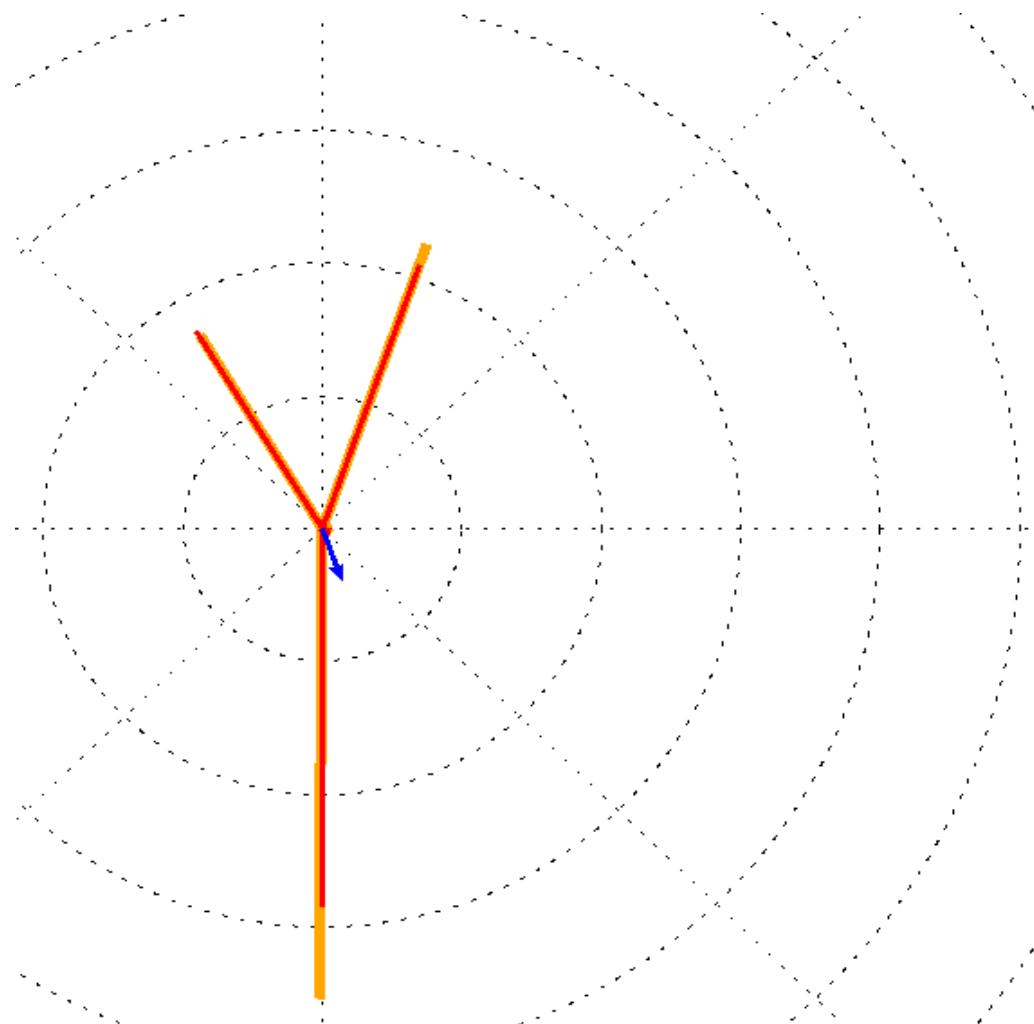
Gen. Met			
ET = 1.3 GeV phi = -2.61			
Reco Met			
ET = 250.5 GeV phi = -0.32			
Uncorr Met			
ET = 202.9 GeV phi = -0.33			
Gen. Jet	ET	Phi	Eta
1661.1	1.23	-0.52	
1589.9	-1.51	0.54	
737.5	-3.11	-0.84	
96.2	0.50	0.19	
14.7	-2.56	-0.17	
Reco Jet	ET	Phi	Eta
1572.8	1.25	-0.49	
1481.5	-1.51	0.56	
867.8	-3.10	-0.83	
90.3	0.48	0.20	
24.0	-2.05	0.58	
20.3	1.32	-2.06	

- Resolution effect (3<sup>rd</sup> jet reco'd high, so MET doesn't line up with either of lead 2 jets)
- Lead two jets reco'd slightly low



Gen. Met ET = 1.3 GeV phi = -1.86			
Reco Met ET = 203.6 GeV phi = 2.33			
Uncorr Met ET = 158.2 GeV phi = 2.34			
Gen. Jet	ET	Phi	Eta
1830.0	2.83	-0.80	
1683.1	-0.27	0.72	
173.1	-1.24	0.69	
71.9	0.40	1.28	
22.2	2.27	-1.32	
13.2	-0.78	-0.60	
12.2	2.43	2.56	
12.0	2.55	0.83	
11.1	1.37	2.56	
10.9	1.95	0.15	
Reco Jet	ET	Phi	Eta
1841.2	2.84	-0.82	
1729.9	-0.29	0.72	
219.4	-1.24	0.68	
74.2	0.37	1.20	
19.9	2.26	-1.00	
19.5	-0.73	-0.38	
14.5	0.81	4.64	
10.0	2.75	-1.37	

- 1<sup>st</sup> jet reco'd low, 3<sup>rd</sup> reco'd high



Gen. Met			
ET = 0.2 GeV phi = 0.99			
Reco Met			
ET = 211.7 GeV phi = -1.22			
Uncorr Met			
ET = 145.2 GeV phi = -1.22			
Gen. Jet	ET	Phi	Eta
1769.0	-1.58	-1.27	
1139.6	1.23	0.67	
853.2	2.11	0.98	
36.1	-0.58	-1.11	
31.6	-0.14	-3.91	
16.5	1.47	0.10	
14.2	-0.51	-3.29	
11.8	-1.94	-2.59	
Reco Jet	ET	Phi	Eta
1431.4	-1.57	-1.28	
1054.0	1.23	0.66	
867.1	2.12	0.98	
36.6	-0.78	-1.02	
33.2	-0.14	-3.86	
33.6	1.56	0.08	
17.0	-1.90	-2.53	
16.1	-0.48	-3.20	

- badly reco'd lead jet
- need to check to see if particle punched through/slipped through crack